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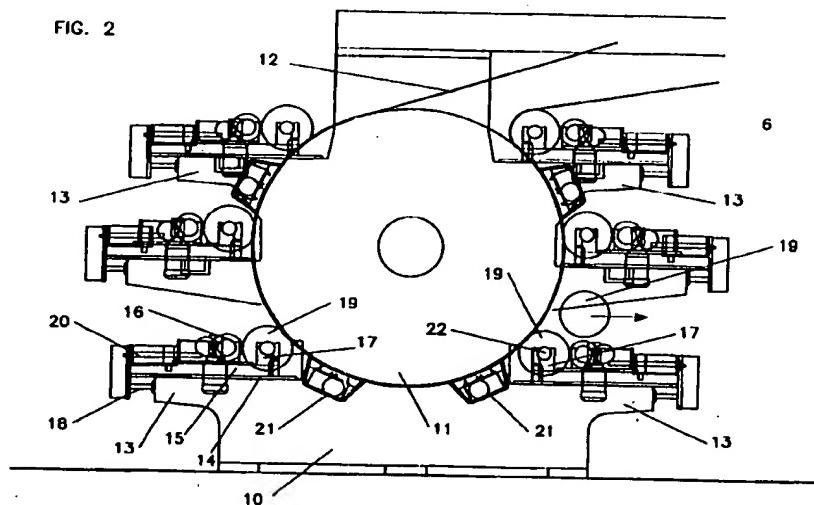
(54) Removal and replacement of the impression cylinders of a flexographic press

(57) A Method for removing and replacing impression cylinders in a flexographic press is described, in which the said impression cylinders (19) are fitted to slide along guides (14) parallel to one another, wherein the cylinder shafts (22) are engaged from beneath and lifted by an amount not less than the difference in height between the lower end of the impression cylinder and the upper end of the devices positioned downstream of the said cylinder, following which the said cylinders are traversed to remove them.

To this end an equipment is provided, including:

- a carriage with a chassis (31) fitted to slide along the structure (29) of the said carriage;
- pairs of supports (34), integral with the said mobile chassis (31), which are designed to receive the ends of the impression cylinder shafts (22);
- equipment to raise the said chassis.

FIG. 2



Description

- [0001] This invention relates to a method and the related equipment for the removal and replacement of the impression cylinders of a flexographic press, in which a set of supports mounted on a carriage are moved so that they engage the cylinder shafts from below, the said supports are raised by a pre-set distance so that the cylinder shafts are removed from their seatings, and the said supports traverse to move the cylinders. To facilitate and/or make possible the operation, the brackets along which the impression cylinder carriages run are positioned on parallel planes, in particular horizontal planes.
- [0002] The method in accordance with the invention enables the cylinders to be removed and replaced very rapidly, with no risk of damage, thus drastically reducing the down time which currently has adverse effects on the output of the press.
- [0003] To illustrate the state of the art and the problems presented by current presses, reference will be made to figure 1, which schematically illustrates a partial side view of a known flexographic press.
- [0004] Flexographic presses are printing presses that use embossed plates, usually made of rubber, which allow any material, including plastic, to be printed.
- [0005] These presses are used not only for printing brochures, etc. but also for printing bags and the like.
- [0006] In most cases the print runs are fairly small, so the down time required to replace the impression cylinders has a significant effect on the output of the press as a whole.
- [0007] In these presses, the film to be stamped, shown as no. 1 in figure 1, runs over a large cylinder 2 which acts as a support and stop; a set of impression cylinders 3, each of which prints with a different coloured ink, is fitted around the said support cylinder.
- [0008] Each of the said impression cylinders is coupled to an inking roller 4, usually made of ceramic.
- [0009] The plate with the image to be printed is fitted to cylinders 3, which have to be replaced whenever a new production run begins.
- [0010] This operation is lengthy and difficult.
- [0011] Inking rollers 4 have to be moved, impression cylinders 3 have to be moved, removed and replaced with others on which the plate for the new job is fitted, after which everything has to be returned to its original position.
- [0012] In currently known presses, a pair of pulleys that run on tracks 5 situated above the press is used to move cylinders 3.
- [0013] For this purpose, inking rollers 4 are first moved aside by sliding them along support brackets 6; then the impression cylinders are moved to distance them from support cylinder 2; the locking devices of the supports of each cylinder shaft are removed and extensions are fitted to the shaft; the extensions of the impression cylinder shafts are engaged with the pulleys one at a time,

and lifted to disengage them from their seatings; and finally, the pulleys are made to traverse along guide 5 to distance each cylinder from the press, so that it can be replaced with a new one.

- 5 [0014] As mentioned, this operation is lengthy and highly delicate, especially because the room for manoeuvre is very limited, and an incorrect movement or imprecise manoeuvre of the pulleys is sufficient to make cylinder 3 collide with the inking roller or the support cylinder, irreparably damaging them.
- 10 [0015] For this reason the cylinder removal operation is very delicate, and it takes a great deal of time to perform it with precision. The replacement of a complete set of impression cylinders takes around 2 hours on average.
- 15 [0016] Bearing in mind that in the case of a medium-sized print run, the type usually required, these presses can complete the job in under an hour, it is obvious that during an 8-hour working day the press is inoperative for some 6 hours for cylinder replacement operations.
- 20 [0017] In addition, to reduce the risk of damage, brackets 6 are inclined in relation to support cylinder 2 to give an open angle towards the exterior as shown in the figure, thus producing more space between the brackets and allowing more room for manoeuvre.
- 25 [0018] For the same reason brackets 6 must be long enough to allow the inking rollers to be moved far enough away to allow the free movement of impression cylinders 3 during replacement.
- 30 [0019] This involves the further disadvantage of making the press larger and less rigid, and makes the operator's job more difficult because in order to open the cylinder shaft supports he needs to operate in parts of the press that are awkward to reach.
- 35 [0020] Another drawback of the known technique is that with this configuration the various cylinders have to follow different routes during the pick-up stage, so simultaneous replacement is impossible.
- 40 [0021] Another drawback, associated with fact that the brackets are fitted with different inclinations, is that this configuration requires the use of different inking tapes for the various brackets.
- 45 [0022] The brackets are only fitted roughly parallel to one another in larger presses, in which support cylinder 2 is very large, and the brackets are therefore far enough apart to allow the impression cylinders to pass between them during replacement.
- 50 [0023] However, this configuration is solely designed to allow the use of identical inking rollers for all brackets, while removal and replacement of the impression cylinders is still performed with a pulley, which picks up the cylinders from above.
- 55 [0024] In some more sophisticated presses, robots are used for this operation, but apart from their very high cost, they do not produce any appreciable saving of time, and in any event they still remove the cylinders from above, with all the drawbacks described above.
- [0025] To eliminate these drawbacks, the present

invention offers a method and the corresponding equipment for the removal and replacement of the impression cylinders of a flexographic press which uses a carriage with a chassis that slides in a basically vertical direction, supports designed to engage the cylinder shafts from below being built into the said chassis.

[0026] For the purpose of replacement, the said supports are moved under the cylinder shafts, and raise them for a pre-set distance sufficient to disengage the cylinders from their seatings, after which the said supports traverse to remove the cylinders from the press.

[0027] This invention will now be described in detail, by way of example but not of limitation, by reference to the annexed figures in which:

- figure 2 is a schematic side view of a flexographic press in accordance with the invention
- figure 3 is a view of the devices designed to remove the cylinders from the flexographic press shown in figure 2
- figure 4 shows a stage of the impression cylinder removal operation by the method in accordance with the invention
- figure 5 is a schematic partial elevation of the cylinder removal devices shown in figure 3
- figures 6 and 7 illustrate details of the impression cylinders and the corresponding supports respectively.

[0028] With reference to figure 2, the structure of a flexographic press which is only partly illustrated in the figure comprises a pair of shoulders 10 constituted by a structure made of steel or the like on which is mounted a cylinder 11, around which the film to be printed, shown as no. 12, runs.

[0029] Shoulders 10 contain a set of brackets 13, each of which is fitted with a ground guide 14.

[0030] A characteristic feature of the invention is that the said brackets are parallel to one another; in particular they are roughly horizontal.

[0031] A printing unit that includes a sliding chassis 15, to which an inking unit 16 is fitted, is mounted on each guide 14.

[0032] At the end of each guide, near cylinder 11, there is a support 17 for an impression cylinder 19.

[0033] Chassis 15 can run along guide 13 driven, for example, by a recirculating-ball screw 18. The inking unit can slide along chassis 15 driven by a second recirculating-ball screw 20.

[0034] During the operation of the press, impression cylinder 19, on which the plate is mounted, receives ink from inking roller 16 and prints the sheet that runs over cylinder 11.

[0035] Other devices of known type are present, such as drying systems 21 which blow hot air onto the printed sheet immediately downstream of the impression cylinders, devices which synchronise the various cylinders (such devices not being illustrated in the figures), etc.

[0036] Impression cylinders 19 are fitted on a shaft 22 which is inserted into supports 17 and projects from the supports for a short distance on either side.

[0037] Each support 17 (see figure 7) basically consists of a fork with a fixed arm 23 and a second arm 24 hinged to the preceding one so that it can rotate around an axis 25.

[0038] The lower end of arm 23 is fixed to the rod of a hydraulic piston 26, and is also subject to the action of a set of Belleville washers 27, which tend to keep arm 24 locked against arm 23, in the closing and locking position of shaft 22.

[0039] When hydraulic piston 26 is activated, arm 24 can be rotated, counteracting the force exerted by springs 27, to open the fork and remove shaft 22 with the cylinder.

[0040] In accordance with the invention, a carriage of the type illustrated in figure 3 is used for the removal and replacement of impression cylinders 19.

[0041] This carriage comprises a base 28 with pairs of uprights 29 interconnected by suitable crosspieces 30, a mobile chassis 31 being fitted to the said uprights.

[0042] Chassis 31 can slide in the vertical direction along uprights 29; the extent of its travel is determined by the length of a slot 32 cut into sliding chassis 31; through which a fixed pin 33 integral with uprights 29 is inserted.

[0043] The movements are controlled by a hydraulic piston of known type, not illustrated in the figure.

[0044] Slot 32 is long enough to allow chassis 31 to perform exactly the movement required to raise impression cylinders 19 by the distance necessary to remove them from their seatings and pass them between the corresponding inking roller and the upper bracket.

[0045] A number of arms 34 are integral with mobile chassis 31; grooved brackets 35, designed to grip and support impression cylinder shafts 22, are fitted to the said arms.

[0046] The system operates as follows:

[0047] When cylinder 19 needs to be replaced at the end of the printing stage, recirculating-ball screw 18 is activated by sliding the printing assembly along guide 14, so as to distance it from cylinder 11.

[0048] Recirculating-ball screw 20 is then activated to separate inking unit 16 from cylinder 19, and hydraulic piston 26 (fig. 7) is activated to control the rotation (anti-clockwise in the figure) of arm 24, which is part of cylinder support 17.

[0049] Support 17 opens to allow removal of the cylinder.

[0050] At this point the operator pushes carriage 28 against the press as illustrated in figure 4, until the base rests against shoulder 10 of the structure which acts as a stop.

[0051] Suitable guides, not illustrated, which ensure exact positioning, will obviously also be fitted at the sides of the route followed by the carriage.

[0052] During this stage arms 34 are then inserted

between the brackets until grooved supports 35 are exactly under shafts 22 of impression cylinders 19.

[0053] At this point it is sufficient to activate the hydraulic piston on the carriage to raise chassis 31 and move grooved supports 35 so that they engage all the impression cylinder shafts 22 simultaneously. 5

[0054] At the end of the travel of chassis 31, the extent of which is determined by the length of slot 32, the impression cylinders will have been raised by exactly the amount required to allow the cylinder to pass between the corresponding inking roller and the bracket above (in figure 2 this removal position is only illustrated for one of the impression cylinders, shown as no. 19'). 10

[0055] The operator can then withdraw the carriage, simultaneously removing all the cylinders, which will then be replaced with new ones, previously prepared on a similar carriage, by repeating the same operations in the reverse order.

[0056] Bearings 36 are mounted on shafts 22 of cylinders 19 and on one side, on a grooved section of the shaft, a cogwheel 37 engages with the cogwheels that transmit the rotary movement to the cylinder. 20

[0057] When the cylinder is fitted onto the press, these parts must be positioned precisely.

[0058] For this purpose the invention includes a set of arms 38 (fig.5), hinged to the carriage structure; at the end of the said arms there is a fork 39 or the like, which fits round the bearings and the cogwheel to keep them exactly in position during the movement of the carriage. 25

[0059] These arms 38 can be controlled in any known way. For example, a fixed stop, schematically shown as no. 40 in figure 3, could be fitted to engage the arm so as to raise it when chassis 31 with the cylinder supports is lowered, and release it, so that the fork moves downwards as a result of its own weight, when chassis 31 is raised to pick up the cylinders. 30

[0060] Arms 33 of the pick-up carriage could also be replaced by similar arms, each fitted with two supports, 35 and 35', to allow simultaneous replacement of the impression cylinders and inking rollers if required. 40

[0061] The system described offers numerous advantages.

[0062] First of all, the cylinder replacement time is reduced from around two hours to a few minutes, with no risk of damage caused by the difficulty of manoeuvring non-rigid cylinder raising and moving equipment.

[0063] The fact that the lifting gear performs a mechanically predetermined, fixed movement when raising the cylinders firstly makes the operator's task easier, and secondly minimises the distance between brackets 13, thus reducing the overall height of the press. Finally, as the lifting gear, with its rigid structure, makes the cylinders perform precise movements with no oscillations, the travel of the cylinders and the corresponding inking units along the brackets can be limited; the length of the brackets can thus be reduced, with advantages in terms of overall dimensions and greater rigidity of the structure. 45

Claims

1. Method for removing and replacing impression cylinders in a flexographic press in which the said impression cylinders (19) are fitted to slide along guides (14) parallel to one another, characterised by the fact that the cylinder shafts (22) are engaged from beneath and lifted by an amount not less than the difference in height between the lower end of the impression cylinder and the upper end of the devices positioned downstream of the said cylinder, following which the said cylinders are traversed to remove them. 5
2. Method in accordance with claim 1, characterised by the fact that a chassis (31) fitted with a set of mobile supports (34) is moved under the shafts (22) of the impression cylinders (19), and the said chassis (31) with the said supports (34) is raised by a predetermined distance to remove the cylinders (19) from their seatings and lift them to a height above the devices installed downstream of them, following which the cylinders are traversed to remove them from the machine. 10
3. Method in accordance with the preceding claims, characterised by the fact that all impression cylinders on the same side of the cylinder on which the sheet to be printed runs are lifted simultaneously. 20
4. Equipment for removing and replacing the impression cylinders of a flexographic press that comprises a number of impression cylinders (19) which are situated near the cylinder (11) supporting the film to be printed, and which slide along guides (13) parallel to one another, the said equipment being characterised by the fact that it includes: 25

 - a carriage with a chassis (31) fitted to slide along the structure of the said carriage;
 - pairs of supports (34, 35), integral with the said mobile chassis (31), which are designed to receive the ends of the impression cylinder shafts
 - equipment to raise the said chassis.

5. Equipment in accordance with claim 4, characterised by the fact that it comprises systems (32, 33) designed to limit the travel of the said mobile chassis (31) to a length sufficient to raise it above the devices situated on the opposite side of the said impression cylinders (19) with respect to cylinder (11). 40
6. Equipment in accordance with claim 5, characterised by the fact that the said mobile chassis (31) contains a slot (32) through which a fixed pin (33) integral with the carriage structure (29) is inserted, 50

- the length of which said slot determines the extent to which the said mobile chassis (31) and therefore the said impression cylinders (19) are raised.
7. Equipment in accordance with claims 4 to 6, characterised by the fact that it includes systems (38, 39) designed to arrest the slide of the bearings (36) and cogwheels (37) mounted on the shafts (22) of the said cylinders (19). 5
8. Equipment in accordance with claim 7, characterised by the fact that the said systems are constituted by arms (38) hinged to the said mobile carriage chassis (31), each of the said arms being fitted at one end with a fork (39) designed to engage the said bearings and the said cogwheels from the side. 10
9. Equipment in accordance with claim 8, characterised by the fact that the said arms engage the said bearings and the said cogwheels by gravity, fixed stops designed to engage the said arms, and control their rotation when the said mobile chassis moves downwards to disengage the said bearings and the said cogwheels, being fitted to the structure 15 of the carriage. 20
10. Equipment in accordance with claim 4, characterised by the fact that further pairs of supports designed to allow the removal of the corresponding inking rollers simultaneously with the impression cylinders are built into the said mobile chassis. 25
11. Flexographic press with equipment for the removal of cylinders in accordance with each of claims 4 to 10, characterised by the fact that the impression cylinders and the corresponding inking units are fitted to slide along parallel guides integral with the press chassis. 30
12. Flexographic press in accordance with claim 11, characterised by the fact that the said guides are horizontal. 35
13. Flexographic press in accordance with each of claims 11 and 12, characterised by the fact that the structure of the said press acts as a stop for the correct positioning of the cylinder pick-up carriage. 40
14. Flexographic press in accordance with each of claims 11 to 13, characterised by the fact that recirculating-ball screws are fitted to move the said inking units along the said guides. 45
15. Flexographic press in accordance with each of claims 11 to 14, characterised by the fact that the seatings of the impression cylinder shafts are constituted by jaw elements in which at least one arm is 50
- subject to the action of elastic equipment that tends to maintain it in a position that closes and locks the shaft, and to the action of a piston designed to control the opening of the said supports, counteracting the force exerted by the said elastic equipment. 55

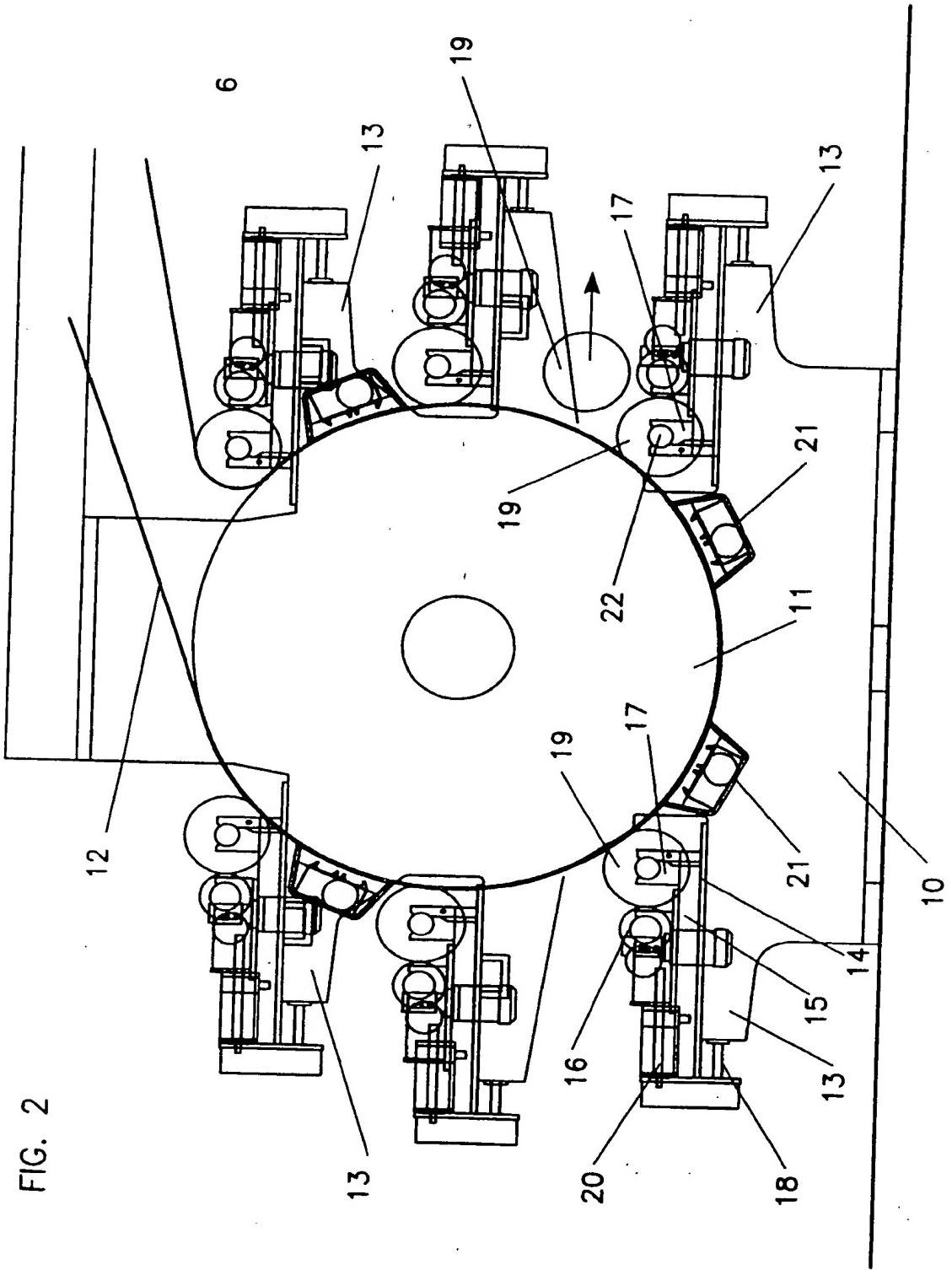


FIG. 2

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FIG. 4

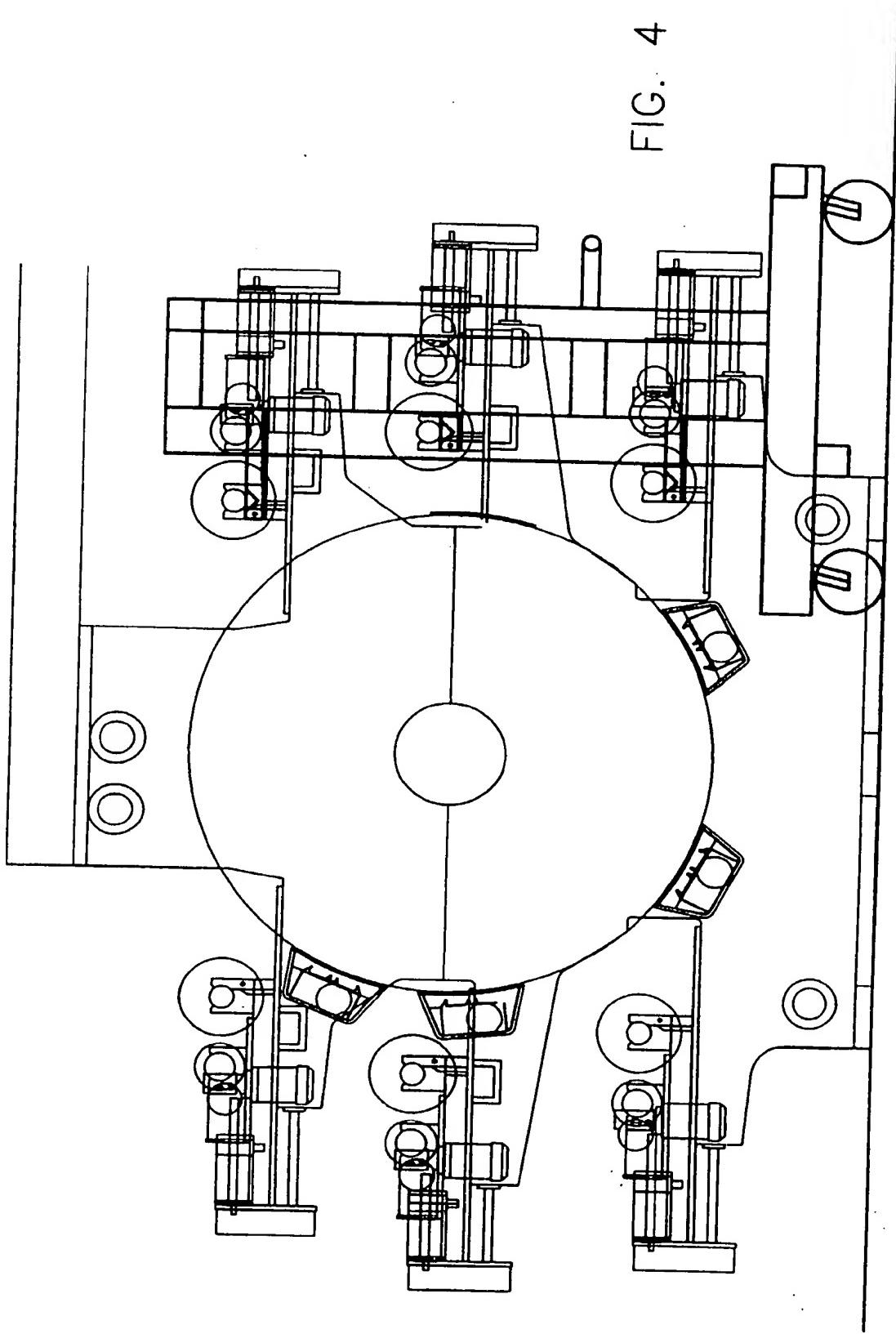
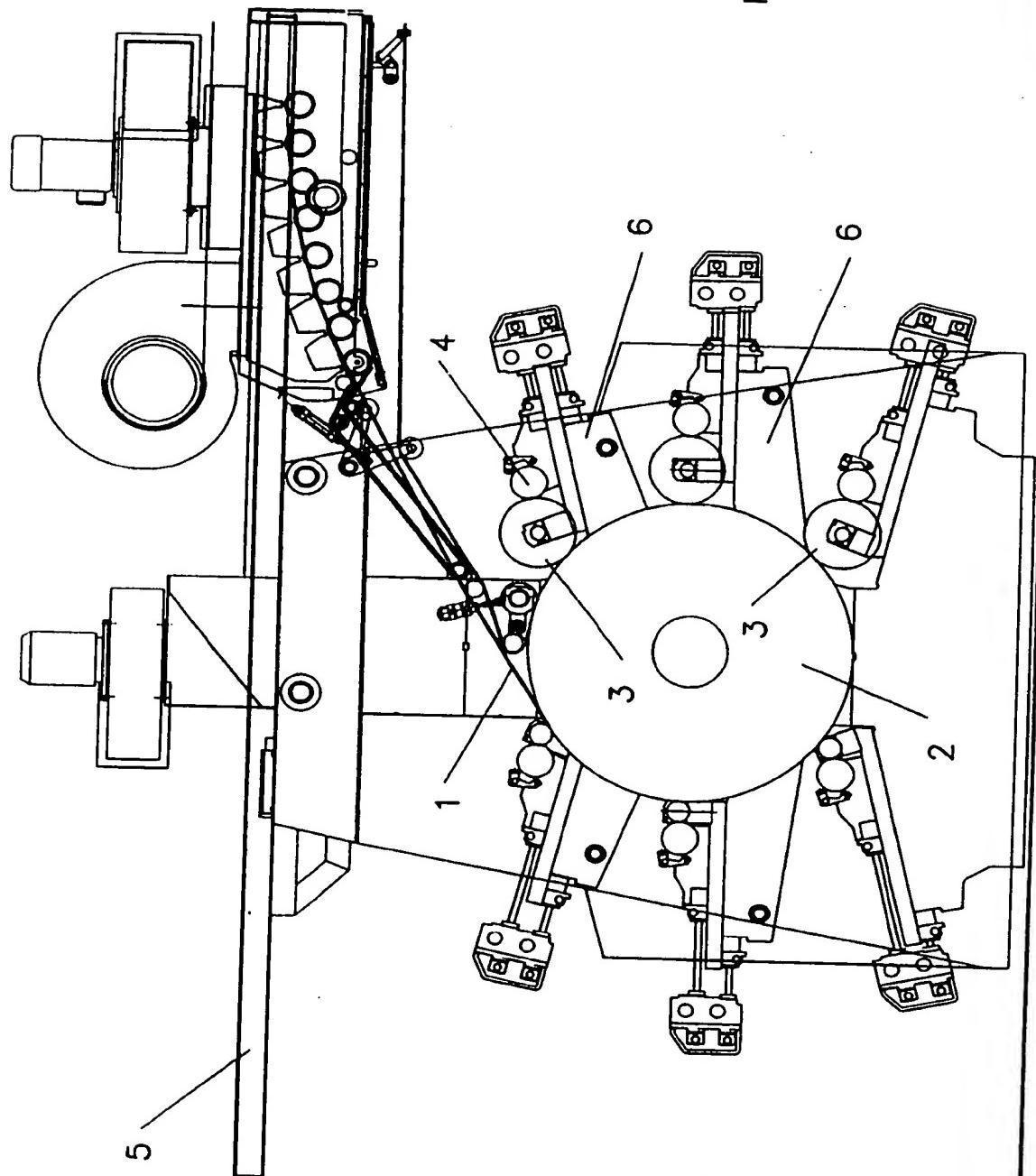


FIG. 1



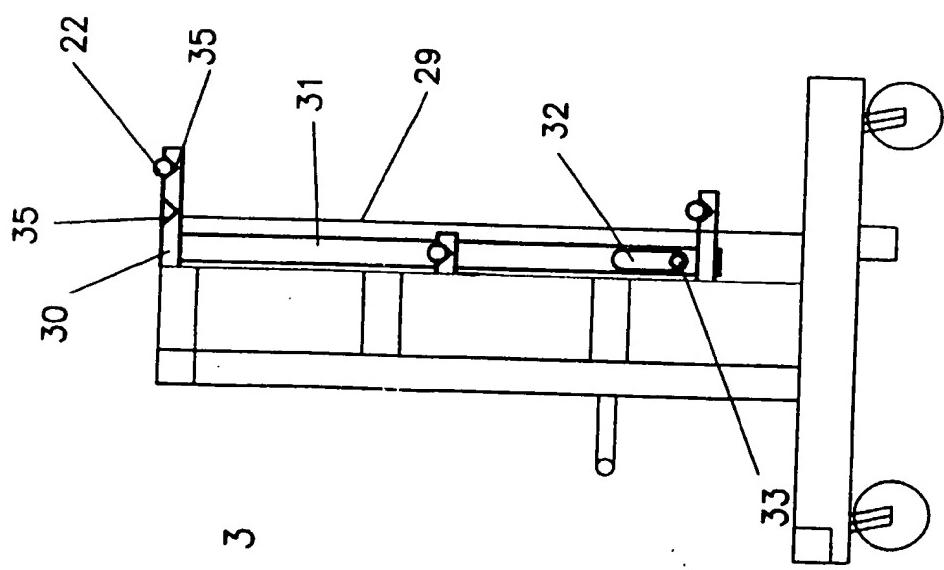
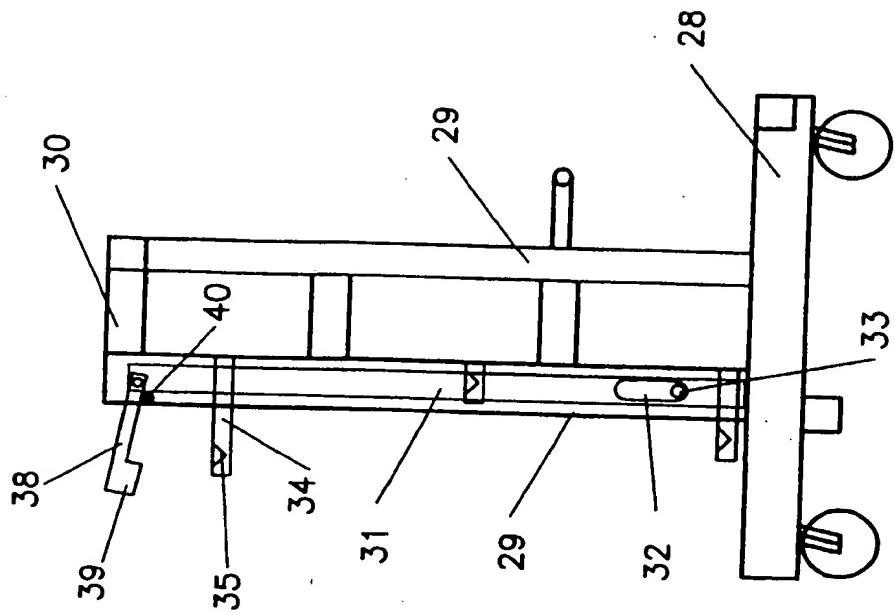


FIG. 3

